

US EPA RECORDS CENTER REGION 5



425309

**PRELIMINARY ASSESSMENT REVIEW  
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
LEWIS RESEARCH CENTER  
CLEVELAND, OHIO**

**SITE EVALUATION REPORT**

**Prepared for**

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
Region 5  
Waste Management Division  
Superfund Program Management Branch  
Chicago, Illinois**

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## **1.0 INTRODUCTION**

Under Contract No. 68-W9-0006, Work Assignment No. C05007, PRC Environmental Management, Inc. (PRC), has evaluated the National Aeronautics and Space Administration (NASA) Lewis Research Center (LeRC) facility in Cleveland, Cuyahoga County, Ohio, as a potential candidate for the National Priorities List (NPL). As part of this evaluation, PRC has prepared this draft site evaluation report. Using PA-Score, PRC evaluated the facility to determine if, and to what extent, it poses a threat to human health and the environment. This report presents the results of PRC's evaluation and summarizes conditions at the facility. It also discusses targets pertinent to exposure pathways associated with the facility. Information was obtained from Volumes I, II, and III of the LeRC Preliminary Assessment, dated June 1991, and the LeRC Preliminary Assessment Supplement, dated September 1992. These reports were prepared by Science Applications International Corporation.

This report has five sections, including this introductory section. Section 2.0 describes the facility. Section 3.0 provides a history of operations at the facility. Section 4.0 describes each source associated with the facility. Section 5.0 provides information about the four migration and exposure pathways (ground-water migration, surface water migration, soil exposure, and air migration).

## **2.0 SITE DESCRIPTION**

The LeRC facility occupies 352 acres in Cuyahoga County on the southwest corner of the City of Cleveland (latitude 41° 24' 30" N, and longitude 81° 51' 30" W). LeRC is bounded to the east by the Cleveland Hopkins International Airport and on the north and west by the Rocky River Reservation, which is part of the Cleveland Metropolitan Park System. The southern boundary of the facility is adjacent to residential and business districts of the City of Brook Park. Land within one mile of the facility is used for commercial, industrial, and residential purposes. Abrams Creek, a tributary to Rocky River, runs through the facility. The facility's location is shown on Figure 1. Figure 2 shows the facility layout.

Operations began at the facility in 1941. The facility was created to be a national center for aeronautics propulsion and related research. LeRC continues operations as NASA's principal facility for research and development of advanced propulsion and power generation systems.

Activities include research of nuclear, electric, and high-energy chemical rockets, as well as nuclear and solar energy conversion systems.

Many hazardous substances (for example, chlorinated and nonchlorinated organic solvents, heavy metals, and ammonia) continue to be generated at LeRC during various research and development activities. One-hundred forty-six structures are located on the facility, including office complexes, testing and laboratory facilities, and support facilities. LeRC discharges its domestic wastewater to the city of Cleveland sanitary sewerage system. The facility's Industrial Waste System (IWS) receives waste from all testing, laboratory, and support facilities. LeRC has its own storm water system. Both the IWS and storm water system discharge to Abrams Creek and the Rocky River. There are many areas at the facility where hazardous substances and petroleum products have been disposed, spilled, or released.

### **3.0 SITE OPERATIONS AND HISTORY**

LeRC began operation as the National Advisory Committee for Aeronautics (NACA) Aircraft Engine Research Laboratory in 1941. NASA was formed in 1958 and took over operations at the facility and renamed it the LeRC. Prior to its acquisition by the federal government, the area now occupied by LeRC was owned by the city of Cleveland and used to provide parking and spectator stands for air races held at the adjacent municipal airport.

Over the life of the facility, a broad range of chemicals, fuels, and cleaners have been used during research and development operations. Table 1 is a list of hazardous substances known to have been used at LeRC. LeRC laboratories and testing facilities generate chemicals used in research and development; fuels, oils, and lubricants; organic solvents; and other commercial products, such as paints, adhesives, and pesticides.

Currently, hazardous substances and wastes are collected for disposal near the various laboratory and testing facilities where they are generated. These materials are transferred to Building 415 for temporary storage until off-site recycling, treatment, or disposal is arranged. Hazardous wastes are not stored at the facility for more than 90 days.

In general, there are three ways by which hazardous substances have been or could be released at the facility: (1) storage and disposal activities at salvage areas and landfills, (2)

**TABLE 1**  
**LIST OF CERCLA HAZARDOUS SUBSTANCES USED AT LeRC**

Benzene	Lithium Hydroxide
Chloroform	Potassium Hydroxide
Methylene Chloride	Sodium Dichromate
Phenylenediamine (META)	Sulfuric Acid
Trichloroethylene	Trifluoroacetic Anhydride
Dichloro-2-Butene (1,4-)	Trifluoromethane Sulfonyl Chloride
Diethyl-3, 4-Furan Dicarboxylate	Zirconium N-Propoxide
Dodecane	Tri-N-Butyl Borate
Tetraethylene Glycol	Hydrazine
Triethylene Glycol	Trichlorotrifluoroethane
140 Solvent*	Triethylamine
Copper Cyanide	Triphenylphosphine
Mercuric Chloride	Diborane
Sodium Azide	Fluorine
Methyl Ethyl Ketone	Ethylene Dichloride
Sodium Phosphate	Phosphine
Trichloroethane (1,1,1-)	Acetone
Acetic Acid	Butanone (2-)
Acetic Anhydride	Chlorobenzene
Ammonia	Dichloroethane (1,2)
Benzylmagnesium Chloride	Dimethyl Furane (2,5)
Chromium Fluoride	Dimethyl-1, 3-Butadiene (2,3)
Cresol (0-)	Ethyl Acetate
Dimethyl Phenol (2,4-)	Furan
Ethylene Glycol	Heptane
Hydrobromic Acid	Hexane
Hydrochloric Acid	Isobutanol
Hydrofluoric Acid	Xylene
Phenylmagnesium Bromide	Mercury
Tetrahydrofuran	Tetrabromobenzene (1,2,4,5-)
Toluene	Tetraphenylcyclopentadienone
Triethylamine	

\* Proprietary solvent from Shell Chemical (Shell Sol 140). The MSDS lists it as having Paraffins 55 percent, Naphthalenes 40 percent, and Aromatics 5 percent. CAS #64722-88-7.

Source: LeRC June, 1991.

uncontrolled spills throughout the facility, and (3) direct discharge to the IWS and storm water systems. There have also been significant releases of petroleum hydrocarbons as a result of storage of various fuels, oils, and lubricants.

The only environmental permit currently held by LeRC is a National Pollution Discharge Elimination System (NPDES) permit for discharge of wastewater from the IWS and storm water systems. The NPDES permit specifically limits pH, oil and grease, total suspended solids, phosphorus, iron, and zinc levels in these discharges. LeRC once held permits for airborne emissions. These permits were issued by the Ohio Environmental Protection Agency (OEPA). However, the operations that required these permits are currently inactive.

Several investigative and remedial projects have been conducted at LeRC. Several mercury and mercury-contaminated cleanup projects have been conducted at the facility. Mercury has been released when manometers used in the testing facilities have broken. Mercury contamination in buildings, sewers, and soil is widespread throughout the facility. LeRC is also proceeding with an underground storage tank (UST) removal and replacement program. The UST removal and replacement program includes soil remediation efforts. LeRC is also evaluating potential releases of polychlorinated biphenyls (PCB) from utilities and releases of asbestos from various buildings at the facility.

Numerous site assessments have been conducted at the facility, usually in conjunction with planned construction activities. During these assessments soil samples have been collected from borings and, occasionally, in situ ground-water samples have been collected from unscreened soil borings. Analytical results from the soil and in situ ground-water samples indicate elevated levels of chlorinated and nonchlorinated organic solvents, petroleum hydrocarbons associated with fuel, and metals. No ground-water monitoring wells have been installed at the facility and very limited sediment and surface water sampling has been conducted. Soil gas surveys have been conducted in areas near leaking USTs. These soil gas surveys indicate elevated levels of petroleum hydrocarbons and chlorinated organic solvents.

Several investigations and remedial actions have been conducted at LeRC. These actions are summarized below.

- In 1977, the facility discovered that a 1,000 gallon UST near Building 4 was leaking and removed the tank from service. The UST was used to store hazardous

waste. The tank was removed from the ground in 1989. Soil and ground water in the pit created by the removal of the tank were sampled and found to contain organic solvents and cyanide. In 1989, 16 drums of soil were removed from the pit. This soil was disposed of as nonhazardous waste at the Rumpke Landfill in Cincinnati, Ohio.

- In 1990, over 410 tons of mercury and mercury-contaminated surficial soils were removed from Building 7 and the surrounding area. Deeper soil contaminated with mercury was left in place for consideration under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).
- An in situ bioremediation project was conducted at the Building 102 tank farm from October 1990 to April 1991. This project was conducted to remediate soil contaminated by fuel-related petroleum hydrocarbons and chlorinated solvents. Soil gas surveys in the area indicate that subsurface contamination still exists in this area.
- In 1991, soil contaminated with trichloroethane at concentrations exceeding Toxicity Characteristic Leaching Procedure (TCLP) limits was removed from an area near Building 35-10 and disposed of as a hazardous waste.
- PCB contaminated fluid and soils were removed from Substation E in 1987 and from Substation A in 1988.
- The facility has conducted limited investigations at Building 109 to evaluate the extent of mercury and chlorinated solvent contamination. From 1964 to 1989, Building 109 was used to clean equipment and components contaminated with mercury. The equipment and components were rinsed with solvents on the ground outside the building. This cleaning operation was conducted very close to IWS drains. Limited soil sampling in the area of Building 109 indicates that elevated levels of mercury and chlorinated solvents are present.
- A soil vapor extraction system has been in operation at the Wiggins Tank Farm since 1990. This system is used to remediate soil contamination that is the result of fuel releases at the tank farm.



- A french drain collection system and passive soil venting system are being used to remediate gasoline and other fuel-related components in soil near Building 4. Several USTs have also been removed from the area.

#### 4.0 SOURCE DESCRIPTION

This section describes the 11 sources associated with the LeRC facility. The following information is presented for each source: a source description, a hazardous substances description, the dates of operation or incidents, and a summary of the sampling activities associated with the source. In general, individual sources have been aggregated based on geographic location, HRS source type, and contaminants of concern. The storm water system is a probable source of releases to surface water but has not been formally evaluated because little is known about potential quantities of hazardous substances attributable to it. The eleven sources evaluated below are associated with the existing industrial wastewater system, past disposal of hazardous substances, and spills or other uncontrolled releases at various buildings throughout the facility.

##### Source 1

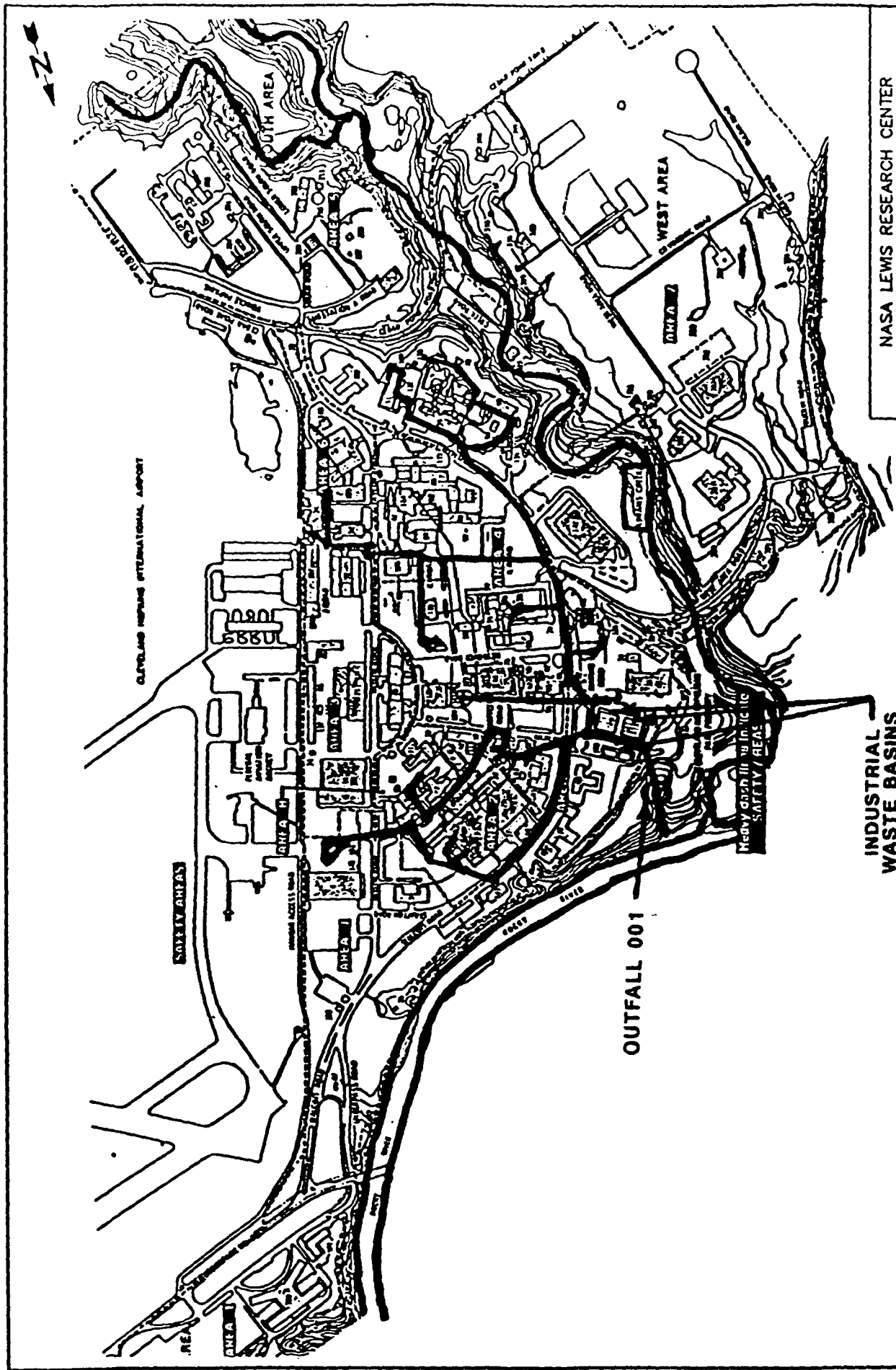
##### IWS Retention Basins

##### Source Description:

The IWS includes three retention basins from which wastewater is discharged directly to the Rocky River. The three basins have a combined capacity of 2.8 million gallons. The discharge from the retention basins is considered a wastestream HRS source. The average daily discharge rate is 1.2 million gallons. The basins are used for solids settling and oil/water separation. The IWS Retention Basins are located in the northwest portion of the facility, adjacent to Abrams Creek. See Figure 3.

##### Sampling Activities:

The IWS discharge is sampled for the constituents specified in its NPDES permit, which includes pH, total suspended solids, phosphorus, iron, zinc, and oil and grease. IWS effluent sampling and Abrams Creek and Rocky River sediment and surface water sampling have not been conducted to verify whether the IWS discharge is a source of hazardous substances.



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FIGURE 3  
INDUSTRIAL WASTE SYSTEM

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**Hazardous  
Substances Description:**

A wide variety of industrial chemicals may have been discharged to the IWS and subsequently to Rocky River. These chemicals include ammonia, trichloroethane (TCA), trichloroethene (TCE), methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), methylene chloride, mercury, lead, zinc, phosphorus, chromium, and petroleum hydrocarbons. Disposal of hazardous substances in the IWS has not been permitted since the 1980s. Prior to the 1980s, hazardous substances were disposed of in the IWS because a large percentage of the NASA employees interviewed believed secondary wastewater treatment was occurring at the IWS and so they did not restrict the amount or types of chemicals discharged to the IWS.

**Dates of Operation  
or Incidents:**

IWS operation began in 1958 and continues today. From 1958 until the 1980s, a wide variety of industrial chemicals and hazardous substances were discharged to the IWS from all testing and laboratory operations at the facility. In 1978, 700 gallons of ammonia was discharged to Rocky River via the IWS. This resulted in a fish kill in Rocky River and Abrams Creek.

**Source 2**

**IWS Manholes, Catchbasins, and Oil and Water Separator Pits**

**Source Description:**

The IWS manholes and catchbasins are considered non-drum containers. There are 67 manholes and catchbasins located throughout the facility. Each manhole and catchbasin has an estimated volume of 400 gallons. The oil and water separator pits are also considered non-drum containers. There are 26 oil and water separator pits of varying sizes located throughout the facility. The total capacity of the 26 pits is about 85,000 gallons. See Figure 3.

**Sampling Activities:**

The only investigatory activities associated with Source 2 have been conducted to determine the physical integrity of the components. In general, the physical integrity of the Source 2 components is

poor. The IWS manholes, catchbasins, and associated piping are in poor condition. A recent video inspection of the underground piping found that a significant number of pipes have collapsed, allowing wastewater to discharge to surrounding soil. Tree roots were also found to be penetrating pipes, and pipe joints were disconnected in some areas.

The oil and water separator pits have been examined to determine their physical integrity but have not been sampled. The physical integrity of the oil/water separator pits is failing, and settled solids have accumulated in the pits. These two facts make the pits' effectiveness questionable.

**Hazardous  
Substances Description:**

The same hazardous substances associated with Source 1 are also associated with Source 2.

**Dates of Operation  
or Incidents:**

The Source 2 components have been in operation from 1958 to the present. On certain occasions, the oil and water separator pits have discharged untreated wastewater to the storm water system because of pump failures or overflows caused by clogged outlets.

**Source 3**

**South Ponds**

**Source Description:**

The buried disposal pond and Building 209 retention basin both meet the criteria of surface impoundment sources. The buried disposal pond area is 10,000 square feet and the Building 209 retention basin is 5,625 square feet. The buried disposal pond and Building 209 retention basin are located in the southern portion of the facility. See Figure 4.

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SOURCE: MODIFIED FROM LARC, SEPTEMBER 1992

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FIGURE 4  
SOUTH AREA

**PRC** ENVIRONMENTAL MANAGEMENT, INC.

<b>Sampling Activities:</b>	No sampling has been conducted at the Source 3 areas.
<b>Hazardous Substances Description:</b>	The buried disposal pond is suspected of receiving industrial chemicals and process wastes, which may include organic solvents and metals. The Building 209 retention basin receives acidic drainage which may include acids, bases, and metals, from the coal storage area.
<b>Dates of Operation or Incidents:</b>	The buried disposal pond can be seen on historical aerial photographs taken between 1947 and 1953. The Building 209 retention basin was constructed in 1977 and is still in operation.
<b>Source 4</b>	<b>Rocket Lab Buildings (Building 109/134 and Building 35 Complex)</b>
<b>Source Description:</b>	<p>Contaminated soil is the source type associated with Building 109/134. Building 109/134 is located close to Abrams Creek in the southern part of the facility. Building 109/136 was used to clean all metal parts and tools contaminated with mercury at the facility. NASA estimates that 15,660 square feet of contaminated soil is associated with this source.</p> <p>The Building 35 Complex is near Building 109/136 in the southern part of the facility. Building 35 Complex is a contaminated soil source. NASA estimates that 66,247 square feet of contaminated soil is associated with this complex.</p> <p>Building 109/136 and the Building 35 Complex are combined as one source because of geographic proximity. See Figure 5.</p>
<b>Sampling Activities:</b>	Limited soil sampling in the Building 109/136 area indicates that the soil is contaminated with chlorinated solvents and mercury up to a maximum of 800 milligrams per kilogram (mg/kg).



Limited soil sampling in the Building 35 Complex indicates soil is contaminated with various organic compounds, including dichloroethane at 600 micrograms per kilogram ( $\mu\text{g/kg}$ ) and TCA. Soil sampling has also indicated 2,4-D pesticide contamination of 0.25 milligrams per liter ( $\text{mg/L}$ ) in one TCLP extract. The source of the pesticide contamination is not known. About 400 cubic yards of contaminated soil was removed and disposed of in 1991.

**Hazardous  
Substances Description:**

A wide variety of hazardous substances is associated with Building 109/136, including chlorinated solvents, mercury, metals, alkali metals, and radionuclides. The hazardous substances associated with Building Complex 35 are chlorinated organic solvents and pesticides.

**Dates of Operation  
or Incidents:**

Metal cleaning activities were conducted at Building 109/136 from about 1950 to 1989. A 300-square-foot area is devoid of vegetation and pathways of distressed vegetation lead from the source to the rim of Abrams Creek. In 1991, one of two manholes at the source was inspected. Upon lifting a section of pipe that had been cut, a combustible gas meter and mercury vapor analyzer went off scale. The inspection was immediately stopped. Nothing further has been done with the pipe. The contamination associated with Building Complex 35 is believed to be the result of fire training activities that were conducted in the past. A portion of Building 35 Complex was constructed over a former fire training area. The dates of these activities are unknown.

**Source 5**

**North Perimeter Area Buildings (Buildings 14, 21, and 77)**

**Source Description:**

This source is contaminated soil associated with Buildings 14, 21, and 77. This source is located in the northern perimeter section of the facility (see Figure 6). NASA estimates the areas of contamination as follows: 65,000 square feet near Building 14,





**FIGURE 8**  
**NORTH PERIMETER AREA BUILDINGS**  
**PNC ENVIRONMENTAL MANAGEMENT, INC.**

59,500 square feet near Building 21, and 21,000 square feet near Building 77.

**Sampling Activities:**

The soil near Building 14 has not been sampled. The soil near Building 21 was sampled for PCBs after a transformer oil spill was reported. Sampling results from on-facility analyses indicated PCB concentrations greater than 50 parts per million (ppm). Subsequent sampling results from off-facility analyses showed very low levels of PCBs. Limited soil samples were taken at Building 77. Methylene chloride was detected at a maximum of 220  $\mu\text{g/kg}$  and TCE was detected at 11.6  $\mu\text{g/kg}$  in one sample.

**Hazardous  
Substances Description:**

Building 14 contains one of five vapor degreasers at the facility. The unit uses TCA and freon, which may have been released based on interviews with long-term employees. The soil near Building 21 is contaminated with PCBs. The soil near Building 77 is contaminated with chlorinated organic solvents.

**Dates of Operation  
or Incidents:**

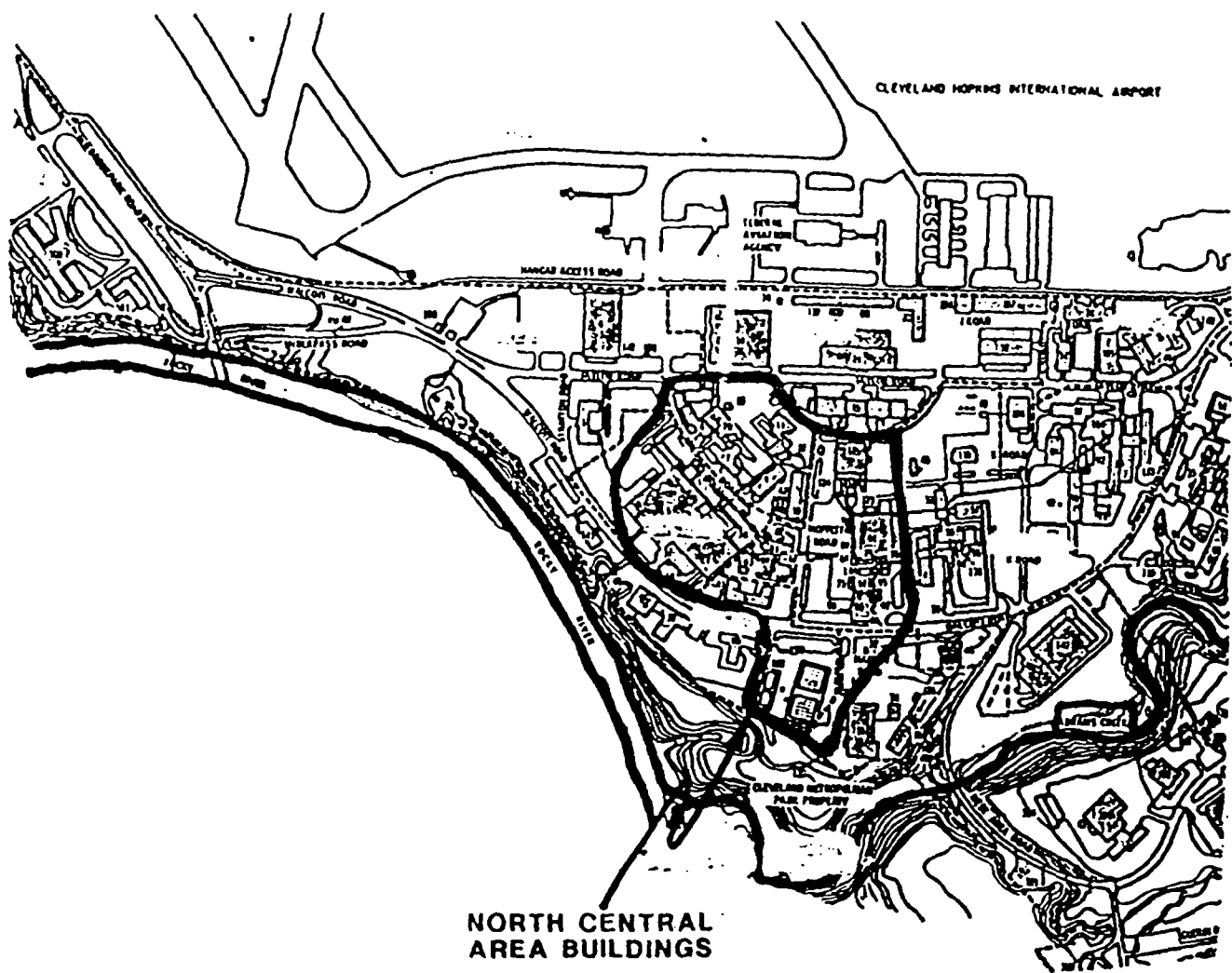
The dates of the releases at this source are unknown.

**Source 6**

**North Central Area Building**

**Source Description:**

Seventeen buildings in the north central area of the facility have soil contamination associated with them. The buildings include 5, 6, 7, 9, 10, 12, 13, 16, 17, 23, 42, 63, 64/66, 81, 82, 99, and 125. NASA assumes that each area is about 10,000 square feet in size (or about 170,000 square feet total). However, this assumption probably underestimates the source area because these buildings are larger than 10,000 square feet. This underestimation does not affect the evaluation of the facility sources. See Figure 7.



NOT TO SCALE

NASA LEWIS RESEARCH CENTER CLEVELAND, OHIO
FIGURE 7 NORTH CENTRAL AREA BUILDINGS
<b>PNC</b> ENVIRONMENTAL MANAGEMENT, INC.

SOURCE: MODIFIED FROM LARC, SEPTEMBER 1992

**Sampling Activities:**

Sampling activities are limited to Buildings 7, 16, 64/66, 81, 99, and 125. Surficial soil samples collected near Building 7 had mercury concentrations from 0.1 mg/kg to 92.0 mg/kg. Deeper soil samples (10 to 25 feet) had mercury concentrations from 0.1 mg/kg to 1.93 mg/kg. A remedial action was conducted at Building 7 to remove mercury from the basement of the building and surficial soils near the building. A soil sample collected near Building 16 had a 1,1-dichloroethene concentration of 43.2 µg/kg, a 1,1-dichloroethane concentration of 20.9 µg/kg, and a 1,1,1-trichloroethane concentration of 98.2 µg/kg. Soil sampling near Building 64/66 indicated a mercury concentration of 0.461 mg/kg in one sample. Soil samples collected near Building 81 showed a methylene chloride concentration of 140 µg/kg, a chloroform concentration of 51 µg/kg, a trichloroethane concentration of 36 µg/kg, and a dichloroethane concentration of 24 µg/kg. Soil samples collected near Building 99 indicated a concentration of 2,786 µg/kg of 1,1,1-trichloroethane. Soil samples collected near Building 125 indicated methylene chloride concentrations of 5.21 µg/kg and 6.52 µg/kg, and benzoic acid concentrations of 10.96 mg/kg and 3.92 mg/kg.

**Hazardous  
Substances Description:**

The following is a list of hazardous substances associated with each of the buildings in this source area:

Building 5 - mercury, solvents, and MEK

Building 6 - solvents

Buildings 7 - mercury

Building 9 - solvents

Building 10 - metals (zinc and chromium) and volatile organic compounds

Building 12 - solvents

Building 13 - PCBs

Building 16 - mercury, volatile organic compounds, and low-level radionuclides

Building 17 - solvents

Building 23 - mercury

Buildings 42 - PCBs

Building 63 - solvents

Building 64/66 - mercury

Buildings 81 and 82 - metals (zinc and chromium) and volatile organic compounds

Buildings 99 - solvents

Building 125 - methylene chloride and benzoic acid

**Dates of Operation  
or Incidents:**

Mercury manometers were used extensively in many of these buildings at the facility from 1942 to 1975. Mercury contamination from ruptured manometers could have occurred any time during this period. Mercury and solvent spills reach soil and are discharged to the municipal, IWS, and storm water systems at the facility. Other types of contamination associated with this source cannot be traced to a specific time period.

**Source 7**

**South Area Landfills**

**Source Description:**

The south area has three landfills: (1) the South 40 Landfill (160,000 square feet), (2) the Old Landfill (8 acres), and (3) the 1957 Landfill (1 acre). These landfills have drainage ways leading directly to Abrams Creek. Seeps from the landfills have been observed to discharge to Abrams Creek. See Figure 4.

**Sampling Activities:**

No sampling has been conducted at this source.

**Hazardous  
Substances Description:**

Industrial chemicals, including chlorinated and nonchlorinated organic solvents and metals, may have been disposed of in the landfills.

**Dates of Operation  
or Incidents:**

The South 40 Landfill was operated from the early 1940s to the late 1970s. The Old Landfill was operated from the late 1940s to the late 1950s. The 1957 Landfill was operated during 1957. Seeps from the landfills have been observed discharging directly to Abrams Creek.

**Source 8**

**South Area Soil Contamination**

**Source Description:**

The south area contains seven areas of soil contamination. The areas are associated with two salvage areas, three building areas, one substation, and a coal storage yard. See Figure 4.

**Sampling Activities:**

Sampling has been conducted in several areas at this source. Sampling results indicate that mercury and various chlorinated organic compounds are present in the source area.

**Hazardous  
Substances Description:**

The hazardous substances associated with this source are metals, including mercury, and chlorinated and nonchlorinated organic solvents.

**Dates of Operation  
or Incidents:**

One or more of these areas has been in operation since the facility began operations. Contamination has occurred from the storage and disposal of hazardous substances and spills of hazardous substances.

**Source 9**

**West Area Buildings (Buildings 300, 301, 308, 322, 333, and 398)**

**Source Description:**

Six buildings located in the west area of the facility have soil contamination associated with them. The buildings are 300, 301,

308, 322, 333, and 398. Each building is assumed by NASA to have 10,000 square feet of soil contamination associated with it. The soil contamination associated with Building 301 is from the release of hydraulic oil contaminated with mercury. The soil contamination associated with Buildings 300, 308, 322, 333, and 398 is believed by NASA to be from contaminated fill material (containing lead, methylene chloride, and other organic compounds) used to fill in the west area of the facility. See Figure 8.

**Sampling Activities:**

Limited soil sampling has been conducted at these source areas. These samples had elevated levels of mercury and organic solvents.

**Hazardous  
Substances Description:**

The hazardous substances associated with this source are mercury and a variety of chlorinated and nonchlorinated organic solvents.

**Dates of Operation  
or Incidents:**

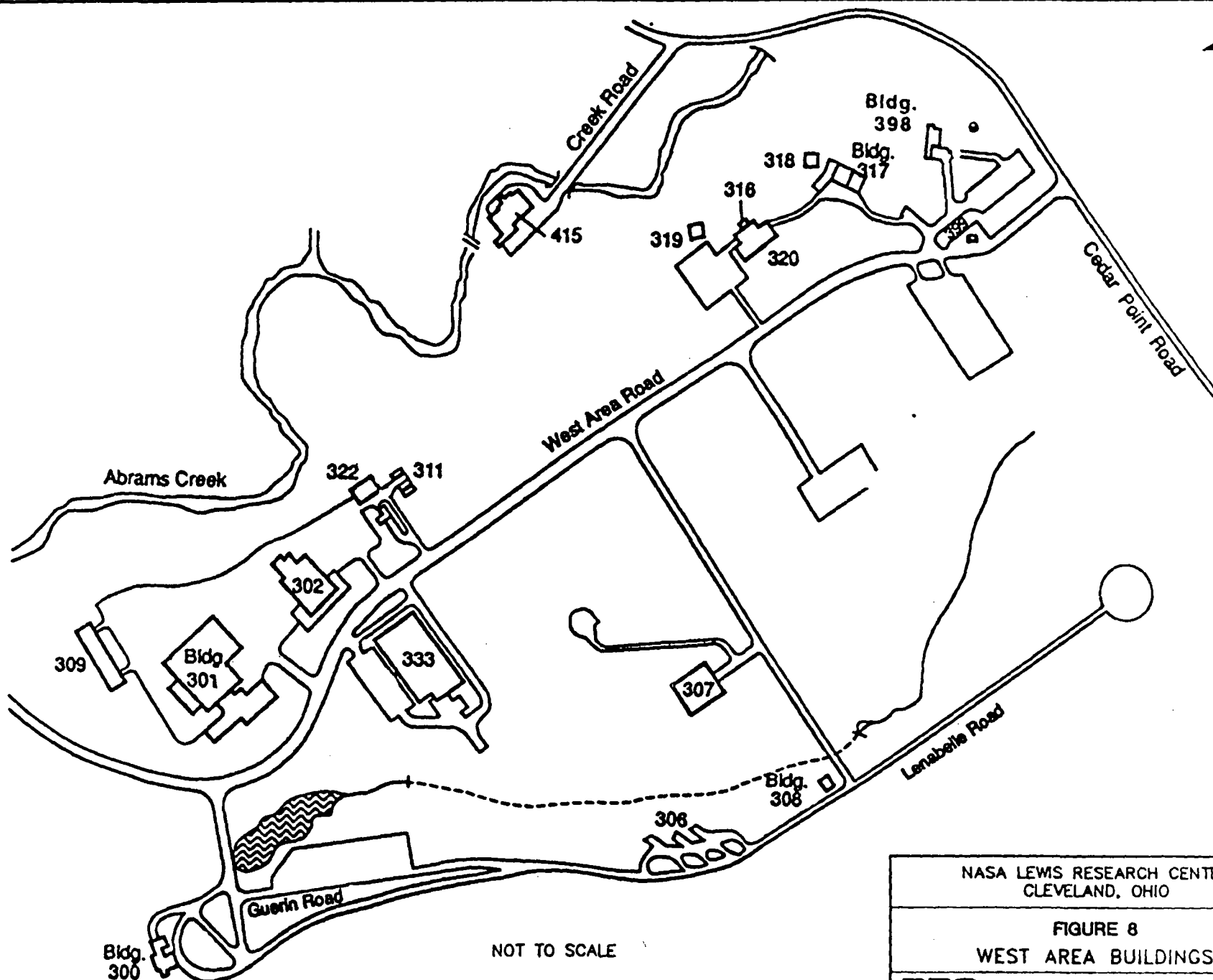
The soil contamination near Building 301 is associated with the release of hydraulic oil contaminated with mercury from a failed diffusion pump at this building on September 21, 1989. The oil and contaminated soil was cleaned up on September 25, 1989. The dates of the incidents leading to the soil contamination associated with the other buildings is unknown.

**Source 10**

**South Central Area Buildings (Buildings 49, 54, and 110)**

**Source Description:**

This source area is made up of soil contamination associated with activities at Buildings 49, 54, and 110, which are located in the south central part of the facility. Building 49 contamination is estimated by NASA to be 10,000 square feet. Building 54 contamination is estimated by NASA to be 10,000 square feet. Building 110 contamination covers an area of 10,000 square feet. See Figure 9.



SOURCE: MODIFIED FROM LARC, SEPTEMBER 1992

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FIGURE 8  
WEST AREA BUILDINGS

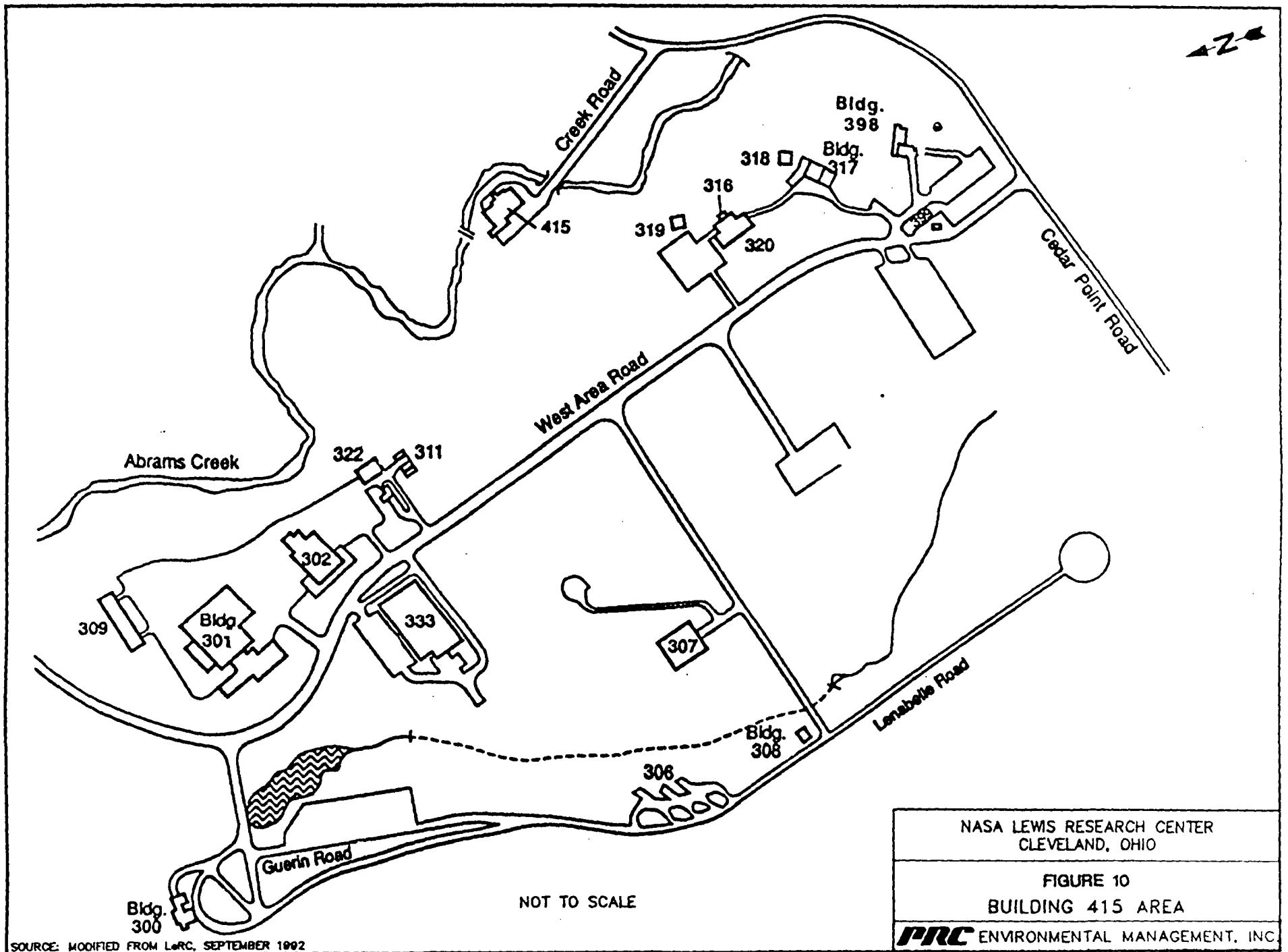
**PMC** ENVIRONMENTAL MANAGEMENT



**PRC** ENVIRONMENTAL MANAGEMENT, INC.

SOURCE: MODIFIED FROM LORC, SEPTEMBER 1992

<b>Sampling Activities:</b>	Limited soil sampling conducted at the source showed elevated levels of semivolatile and volatile organic compounds and mercury.
<b>Hazardous Substances Description:</b>	The hazardous substances associated with this source are chlorinated and nonchlorinated organic solvents, semivolatile organic compounds, and mercury.
<b>Dates of Operation or Incidents:</b>	No specific dates of operation are available. Soil contamination at these buildings is the result of spills and possible disposal of mercury and organic solvents.
<b>Source 11</b>	<b>Building 415 Area</b>
<b>Source Description:</b>	Building 415 is a source of soil contamination. The area of contamination is estimated by NASA to be 10,000 square feet. Building 415 is currently used to store hazardous substances and wastes generated throughout the facility. See Figure 10.
<b>Sampling Activities:</b>	No sampling activities have been conducted at this source.
<b>Hazardous Substances Description:</b>	Numerous hazardous substances may have released to the soil from the activities at Building 415. Table 1 contains the complete list of possible chemicals.
<b>Dates of Operation or Incidents:</b>	Building 415 was used as a rocket combustion research facility from 1960 to 1975. From 1975 until the present, Building 415 has been used to store hazardous substances and wastes generated at the facility.



## **5.0 MIGRATION AND EXPOSURE PATHWAYS**

This section describes the four migration and exposure pathways associated with the LeRC facility. Section 5.1 discusses the ground-water migration pathway; Section 5.2 discusses the surface water migration pathway; Section 5.3 discusses the soil exposure pathway; and Section 5.4 discusses the air migration pathway.

### **5.1 GROUND-WATER MIGRATION PATHWAY**

This section discusses the ground-water migration pathway and how it is affected by contamination at the facility.

#### **5.1.1 Geology and Soils**

LeRC is located in an area primarily covered by a thin layer (several inches to a few feet) of lacustrine clay and silt deposits underlain by Wisconsin aged glacial tills. Natural soils at the facility have been removed or covered by miscellaneous fill material. Soils of the Mahoning Association, the Brecksville Silt Loam, the Chagrin Silt Loam, and the Jimtown Loam are found at the facility. These soils consist mainly of glacial till and alluvium deposits and are composed chiefly of clay, silt, sand, and gravel in varying proportions.

The glacial till in northwestern Ohio is underlain by sandstones, carbonates, shales, and salts. Bedrock outcroppings in the bed and valley walls of the Abrams Creek/Rocky River surface water system show Mississippian-aged Berea Sandstone and Bedford Shale underlain by Devonian-aged Cleveland Shale and Chagrin Shale.

Ground water at and near LeRC has not been well characterized. There are no extensively used aquifers within the 4-mile target distance. Ground water probably occurs in two zones: (1) as perched ground water in fill material and the glacial till, and (2) in the shale bedrock. Ground-water flow probably follows the general topography toward Abrams Creek and the Rocky River.

Ground-water flow in the shale bedrock has not been well defined. Shale bedrock beneath LeRC is reported to be a poor source of ground water with low yields of 3 to 4 gallons per minute.

### **5.1.2 Ground-Water Releases**

Limited sampling results indicate that shallow ground water at the facility is contaminated. In situ ground-water samples collected from shallow soil borings and pits excavated to remove contaminated soil have shown volatile organic compound contamination. No ground-water monitoring wells have been installed at the site. There is no data on the shale bedrock aquifer. Sources at the facility, especially basins and landfills, are not lined and received liquid wastes.

### **5.1.3 Targets**

Based on a 1969 survey by the Ohio Department of Natural Resources, only 220 individuals in the Rocky River basin (a nearly 300 square mile area) obtained their drinking water supply from ground-water sources. According to government records, a total of 31 wells have been drilled within the 4-mile target distance. Only seven of the wells are currently permitted by the city and county as sources of domestic or commercial drinking water. Apparently the unpermitted wells were abandoned when significant commercialization occurred in southwest Cleveland suburbs and when the Cleveland municipal water supply system was expanded. Cleveland municipal water is obtained from Lake Erie.

## **5.2 SURFACE WATER MIGRATION PATHWAY**

This section discusses the surface water migration pathway and how it is affected by contamination at the facility.

### **5.2.1 Migration Route**

Surface water near the facility consists of Abrams Creek, several of its unnamed tributaries, and the Rocky River. Abrams Creek flows through the facility into Rocky River. Rocky River is adjacent to the facility and flows into Lake Erie, about 9 river miles from LeRC. The probable points of entry associated with surface water are overland flow, especially in the west and south areas of the site where defined drainage swales are located, and storm water and industrial wastewater discharges to Abrams Creek and Rocky River from numerous manmade outfalls. Overland surface water drainage at the facility is directed to Abrams Creek and Rocky River. Ground water also discharges to Abrams Creek and the Rocky River. The flow rate for Abrams Creek is not available, but is estimated to be 5 to 10 percent of that of Rocky River. The

Rocky River flow rate averages about 250 cubic feet per second. This information was obtained from a gauging station located 0.4 mile upstream of the facility.

#### **5.2.2 Surface Water Releases**

Abrams Creek and Rocky River receive the following discharges from LeRC: landfill seeps, shallow ground-water discharge, storm water discharge, and IWS discharge. No surface water or sediment sampling has been conducted to characterize the impacts of these discharges. There has been one documented release to surface water from LeRC. In 1978, 700 hundred gallons of ammonia was released to Abrams Creek and Rocky River from the IWS and resulted in a documented fish kill. It is very likely that other releases from the IWS and storm sewer have occurred in the past. Based on interviews with past and current employees, hazardous substances were routinely discharged to the IWS because many building managers thought more extensive treatment was occurring. However, the IWS only performs oil and water separation and allows solids to settle in the retention basins. The IWS is monitored for general water quality parameters (pH, total suspended solids, oil and grease, phosphorus, iron, and zinc) in accordance with LeRC's NPDES permit.

#### **5.2.3 Targets**

The Rocky River Reservation extends the entire course of the river from LeRC to Lake Erie. The Rocky River Reservation is an extensively used sports fishery and a sensitive environment (it is a critical habitat for salmon spawning).

The Rocky River enters Lake Erie about 9 river miles downstream of LeRC. The lake covers an area of 9,919 square miles and includes a volume of 113 cubic miles. Lake Erie is a major fresh water fishery for both sport and commercial fishing. Lake Erie also supplies drinking water to the greater Cleveland metropolitan area. Four surface water intakes provide the water for this drinking water system. Three of the four intakes are within the 15-mile target distance. The Cleveland municipal drinking water system serves over 1.5 million people.

### **5.3 SOIL EXPOSURE PATHWAY**

Various areas of surficial soil at LeRC have been contaminated by past disposal practices and spills of hazardous substances, including chlorinated and nonchlorinated organic solvents,

mercury, lead, and fuel. There are no residential areas, schools, or daycare facilities within 200 feet of documented soil contamination. There is, however, a large worker population of over 5,000 people at the facility. Some or all of these workers may be within 200 feet of surficial soil contamination. About 31,375 people work and live within 1 mile of the facility. Access to the facility is well controlled. The facility is completely fenced and access is controlled by security guards who are on duty 24 hours a day.

#### **5.4 AIR MIGRATION PATHWAY**

It is possible that volatilizing compounds from contaminated soil and from the cooling towers operating at the facility may result in a release to the air pathway. Regularly occupied buildings exist adjacent to potential sources of air releases. An estimated 236,375 people live and work within a 4-mile radius of the facility.

**ATTACHMENT 1**  
**CONCLUSIONS AND RECOMMENDATIONS**

**CONFIDENTIAL**



**CONFIDENTIAL**

**ATTACHMENT 1  
CONCLUSIONS AND RECOMMENDATIONS**

Based on the LeRC Preliminary Assessment (June 1991) and the Preliminary Assessment Supplement (September 1992), the NASA Lewis Research Center would receive an HRS score of 28.5 or greater.

Although analytical data have not been collected to demonstrate that a release to surface water has occurred from LeRC, it is highly likely that a release has occurred and that targets have been exposed to contamination from the site. If a release and contamination could be documented, the site should receive an HRS score of 28.5 or greater. Therefore, PRC recommends that additional samples be collected to determine if a release to surface water has occurred and if targets have been exposed to contamination.

PRC also recommends that LeRC be referred to the Emergency Response Branch for a removal site evaluation of the Building 109/136 area and all sewers associated with past releases of mercury and chlorinated organic solvents at Building 109/136. NASA attempted an investigation of sewer lines near Building 109/136 and abandoned the effort when their field monitoring instruments, including a mercury vapor analyzer, went off scale immediately after the sewer was opened.

**PA-Score 2.1 Scoresheets**  
**NASA Lewis Research Center - 03/03/93**

**Page: 1**

OMB Approval Number: 2050-C  
 Approved for Use Through: 4

POTENTIAL HAZARDOUS  WASTE SITE  PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: OH	CERCLIS Numbe OH0800005035
	CERCLIS Discovery Date 2/12/88	

**1. General Site Information**

Name: NASA Lewis Research Center		Street Address: 21000 Brook Park Rd.			
City: Cleveland	State: OH	Zip Code: 44145	County: Cuyahoga	Co. Code:	Con Dis
Latitude: 41° 24' 30.0"	Longitude: 81° 51' 30.0"	Approx. Area of Site: 352 acres		Status of Site: Active	

**2. Owner/Operator Information**

Owner: National Aeronautics & Space Adm.			Operator: National Aeronautics & Space Adm.		
Street Address: 21000 Brook Park Rd.			Street Address: 21000 Brook Park Rd.		
City: Cleveland			City: Cleveland		
State: OH	Zip Code: 44145	Telephone: 216-433-8852	State: OH	Zip Code: 44145	Telephone: 216-433-8852
Type of Ownership: Federal Agency			How Initially Identified: RCRA/CERCLA Notification		

<b>POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM</b>		<b>IDENTIFICATION</b>	
		State: OH	CERCLIS Number: OH0800005035
		CERCLIS Discovery Date: 2/12/88	
<b>3. Site Evaluator Information</b>			
Name of Evaluator: Therese Gioia		Agency/Organization: PRC	
Date Prepared: 2/28/93			
Street Address: 1921 Rohlwing Rd.		City: Rolling Meadows	State: IL
Name of EPA or State Agency Contact: Jeanne Griffin		Telephone: 312-886-3007	
Street Address: 77 W. Jackson Blvd		City: Chicago	State: IL
<b>4. Site Disposition (for EPA use only)</b>			
Emergency Response/Removal Assessment Recommendation: Yes	CERCLIS Recommendation: Higher Priority SI	Signature:	
Date:	Date:	Name:	
		Position:	

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5. General Site Characteristics			
Predominant Land Uses Within 1 Mile of Site: Industrial Commercial Residential	Site Setting:  Urban	Years of Operation: Beginning Year: 1941  Ending Year: 1993	
Type of Site Operations: Other Federal Facility: National Aeronautics and Space Admin.		Waste Generated: Onsite	
		Waste Deposition Authorized By: Present and Former Owner	
		Waste Accessible to the Public No	
		Distance to Nearest Dwelling, School, or Workplace: 0 Feet	

6. Waste Characteristics Information				
Source Type	Quantity		Tier	General Types of Waste:
Surface impoundment	5.70e+09 lbs		W	Metals
Non-drum containers	1.12e+05 gals		V	Organics
Surface impoundment	1.56e+04 sq ft		A	Inorganics
Contaminated soil	8.19e+04 sq ft		A	Solvents
Contaminated soil	1.46e+05 sq ft		A	Laboratory/Hospital Waste
Contaminated soil	1.70e+05 sq ft		A	Radioactive Waste
Landfill	5.52e+05 sq ft		A	Pesticides/Herbicides
Contaminated soil	2.45e+05 sq ft		A	Acids/Bases
Contaminated soil	6.00e+04 sq ft		A	Oily Waste
Contaminated soil	3.00e+04 sq ft		A	
Contaminated soil	1.00e+04 sq ft		A	
Tier Legend C = Constituent    W = Wastestream V = Volume        A = Area				Physical State of Waste as Deposited Solid Liquid

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<b>7. Ground Water Pathway</b>			
<b>Is Ground Water Used for Drinking Water Within 4 Miles:</b> No	<b>Is There a Suspected Release to Ground Water:</b> Yes	<b>List Secondary Target Population Served by Ground Water Withdrawn From:</b>	
<b>Type of Ground Water Wells Within 4 Miles:</b> Private	<b>Have Primary Target Drinking Water Wells Been Identified:</b> No	0 - 1/4 Mile 0	
<b>Depth to Shallowest Aquifer:</b> 14 Feet		>1/4 - 1/2 Mile 0	
<b>Karst Terrain/Aquifer Present:</b> No	<b>Nearest Designated Wellhead Protection Area:</b> None within 4 Miles	>1/2 - 1 Mile 0	
		>1 - 2 Miles 21	
		>2 - 3 Miles 14	
		>3 - 4 Miles 14	
		<b>Total 49</b>	

<p>POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM</p>	IDENTIFICATION										
	State: OH	CERCLIS Numbe OH0800005035									
	CERCLIS Discovery Date 2/12/88										
<p>8. Surface Water Pathway <span style="float: right;">Part 1 of 4</span></p>											
<p>Type of Surface Water Draining Site and 15 Miles Downstream: Stream River Lake</p>	<p>Shortest Overland Distance From Any Source to Surface Water:  0 Feet 0.0 Miles</p>										
<p>Is there a Suspected Release to Surface Water: Yes</p>	<p>Site is Located in: &gt;10 yr - 100 yr floodplai</p>										
<p>8. Surface Water Pathway <span style="float: right;">Part 2 of 4</span></p>											
<p>Drinking Water Intakes Along the Surface Water Migration Path: Yes</p>											
<p>Have Primary Target Drinking Water Intakes Been Identified: No</p>											
<p>Secondary Target Drinking Water Intakes:</p> <table border="0"> <tr> <td>Name</td><td>Water Body/Flow(cfs)</td><td>Population Served</td></tr> <tr> <td>Cleveland</td><td>Coastal,ocean,Gr.Lakes</td><td>1500000</td></tr> <tr> <td></td><td>Total Within 15 Miles:</td><td>1500000</td></tr> </table>			Name	Water Body/Flow(cfs)	Population Served	Cleveland	Coastal,ocean,Gr.Lakes	1500000		Total Within 15 Miles:	1500000
Name	Water Body/Flow(cfs)	Population Served									
Cleveland	Coastal,ocean,Gr.Lakes	1500000									
	Total Within 15 Miles:	1500000									

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8. Surface Water Pathway		
		Part 3 of 4
Fisheries Located Along the Surface Water Migration Path: Yes Have Primary Target Fisheries Been Identified: Yes Secondary Target Fisheries: None		
8. Surface Water Pathway		
		Part 4 of 4
Wetlands Located Along the Surface Water Migration Path? (y/n) No Have Primary Target Wetlands Been Identified? (y/n) No Secondary Target Wetlands: None		
Other Sensitive Environments Along the Surface Water Migration Path: Yes Have Primary Target Sensitive Environments Been Identified: Yes Secondary Target Sensitive Environments: None		

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9. Soil Exposure Pathway

Are People Occupying Residences or Attending School or Daycare on or Within 200 Feet of Areas of Known or Suspected Contamination: No	Number of Workers Onsite: > 1000
Have Terrestrial Sensitive Environments Been Identified on or Within 200 Feet of Areas of Known or Suspected Contamination: No	

10. Air Pathway

Total Population on or Within: Onsite 5075 0 - 1/4 Mile 800 >1/4 - 1/2 Mile 5700 >1/2 - 1 Mile 19800 >1 - 2 Miles 29000 >2 - 3 Miles 82000 >3 - 4 Miles 94000 Total 236375	Is There a Suspected Release to Air: No  Wetlands Located Within 4 Miles of the Site: No  Other Sensitive Environments Located Within 4 Miles of the Site: Yes
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Sensitive Environments Within 1/2 Mile of the Site:

Distance	Sensitive Environment Type/Wetlands Area(acres)
0 - 1/4	Areas used by spawning fishlife